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2. Patent application number *(The Patent Office will fill in this part)*	0405088.6 05 MAR 2004
3. Full name, address and postcode of the or of each applicant *(underline all surnames)*	Optima Solutions UK Limited Loch of Loirston Wellington Road ABERDEEN AB12 3LN
Patents ADP number *(if you know it)*	786545003
If the applicant is a corporate body, give the country/state of its incorporation	UK
4. Title of the invention	Improved nozzle
5. Name of your agent *(if you have one)*	Kennedys Patent Agency Limited
"Address for service" in the United Kingdom to which all correspondence should be sent *(including the postcode)*	Floor 5, Queens House 29 St Vincent Place Glasgow G1 2DT
Patents ADP number *(if you know it)*	08058240002

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6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and *(if you know it)* the or each application number			

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7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application		

8. Is a statement of inventorship and of right to grant of a patent required in support of this request? *(Answer 'Yes' if:* *a) any applicant named in part 3 is not an inventor, or* *b) there is an inventor who is not named as an applicant, or* *c) any named applicant is a corporate body.* *See note (d))*	Yes

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Description	11
Claim *(s)*	
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11. I/We request the grant of a patent on the basis of this application.

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KENNEDYS | 04 March 2004

12. Name and daytime telephone number of person to contact in the United Kingdom

Simon Black | Tel: 0141 226 6826

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Improved Nozzle

The present invention relates to a nozzle and in particular to a nozzle for use with a pressurised water source as typically used in the offshore environment.

During well completion, a surface well test package is used to evaluate well reservoir parameters and hydrocarbon properties. The evaluation of hydrocarbon properties requires the flow of a hydrocarbon fluid to the well test package from the well. Once the test has been made it is necessary to dispose of the hydrocarbon fluid. This is done by igniting the hydrocarbon fluid and flaring it from drilling rig, Floating Production Storage Offloading (FPSO's), Drillships, Platforms and Land rig burner booms. The flaring operation can cause temperatures to reach levels where the intense heat can compromise the integrity of the structure and rig safety equipment such as lifeboats, lifecrafts etc and create a hazardous working environment for personnel. One way of reducing the temperature around the flaring hydrocarbons is to form a water wall around the flare, known as a rig

cooling system and/or heat suppression and/or deluge system.

Systems of this type provide an outer wall of water designed to surround the flare which mimics the flare profile and/or shields the flare. The outer wall of water can take the form of a solid flat or conical shield or curtain and a central source which has a secondary function of generating a very fine mist of water through the central outlet of the dual nozzle design. The fine mist of water is designed to remove energy from the flare, and the outer wall of water is designed to create a barrier which also removes energy and therefore temperature from the flare.

In order to produce and shape a jet of water, it is necessary to connect a nozzle to a high-pressure water source and to engineer the nozzle such that an outer (typically cone-shaped) wall of water is formed in conjunction with a fine mist of water directed behind the flare.

An example of this type of nozzle is provided in UK Patent No. GB2299281. This document discloses a nozzle attachable to a high-pressure water source in which a narrow opening is positioned between a deflecting surface which opposes the direction of flow of water, and a guiding surface angled towards the direction of flow of the water and which defines the shape of the outer wall of water that is produced by this nozzle. It has been found that the combined action of the deflecting surface and guiding surface disrupts the water flow and causes energy to be dissipated thus lowering the water pressure.

It is an object of the present invention to provide an improved nozzle.

In accordance with a first aspect of the present invention, there is provided a nozzle for a hose or fixed pipeword installation, the nozzle comprising:
a body;
a channel extending through the body of the nozzle; and
a fluid deflector arranged at or near the downstream end of the channel, and wherein the fluid deflector determines the direction of flow of the fluid as it leaves the nozzle.

Preferably, the fluid deflector has a deflecting surface positioned relative to the end of the channel to define the width of the channel at or near the downstream end of the channel.

More preferably, said channel width is variable.

More preferably, the channel is provided with a gap suitable for accommodating a spacer to alter the position of the fluid deflector relative to the end of the channel, thereby varying the width of said channel.

Preferably, the fluid deflector comprises the deflecting surface and a central beam extending from the deflecting surface into the body of the nozzle, the central beam being attachable to the body of the nozzle.

Preferably, the nozzle is further provided with pressure sensing means.

Preferably, the channel extending through the body of the nozzle is an annular channel.

Preferably, the nozzle further comprises a central channel extending through the body of the nozzle.

Preferably, the central channel extends through the central beam of the deflector.

More preferably, the pressure sensing means is located in the fluid deflector.

Optionally, the pressure sensing means is located in the body of the nozzle.

Preferably, the fluid deflector means further comprises filter coupling means for coupling a filter to the upstream end of the central channel.

Preferably, the fluid deflector means further comprises nozzle-coupling means for coupling a nozzle to the downstream end of the central channel.

More preferably, said nozzle coupling means is connectable to a nozzle for producing a fine spray of fluid.

Preferably, the fluid deflector means is provided with a frusto-conical deflecting surface, angled away from the direction of fluid flow.

More preferably, the frusto-conical deflecting surface extends beyond the maximum width of the channel to direct the flow of fluid.

Preferably, the nozzle is generally cylindrical in shape.

Preferably, the nozzle is further provided with sensor means attached thereto.

More preferably, the sensor means are attached to the fluid deflector means.

More preferably, the sensor means are embedded in a front surface of the fluid deflector means.

The sensor means can be temperature sensors, gas sensors, or other suitable sensors and maybe hardwired through the nozzle to provide information on the temperature, gas composition pressure or other information.

Preferably, the nozzle is constructed in a single piece.

In accordance with a second aspect of the invention there is provided a kit of parts for a nozzle in accordance with the first aspect of the invention, the kit of parts comprising a body and a fluid deflector.

Preferably, the kit of parts further comprises a coupling means adapted to connect the deflector to the body.

The present invention will now be described by way of example only, with reference to the accompanying drawings in which:

Figure 1 is a cross-sectional view of a nozzle in accordance with the present invention;

Figure 2 is a further sectional view of the nozzle of Figure 1;

Figure 3 is another sectional view of the nozzle of Figure 1 in which the fluid flow paths are shown;

Figure 4a shows the deflector means of the present invention, Figure 4b shows a coupling ring as used in the present invention and Figure 4c shows the nozzle body of the present invention; and

Figure 5 shows a second embodiment of the present invention in which sensors are embedded into the front surface of the deflector means.

In the embodiment of the present invention shown in Figure 1, the nozzle 1 is constructed from three separate components. These are the nozzle body 3, the coupling ring 5 and the deflector 7.

The deflector 7 is provided with a front surface 11, a deflecting surface 9 which is angled away from the direction of fluid flow and a central beam or projection 10 which extends into the nozzle body 3 and provides a central channel 21.

The central channel 21 has a filter coupler 33 to which a wire-mesh cone known as a Witch's Broom can be attached. The purpose of this filter is to prevent particulates

from entering the central channel. A second coupler 13 is attached to the downstream end of the central channel 21. The second coupler 13 is used to attach a further nozzle for shaping the water flow. Suitably, the nozzle is designed to produce a fine spray or fog of water.

Typically, the water used will be filtered upstream of the nozzle. Therefore, the size of particulars entering the nozzle will have a maximum determined by the upstream filter.

The gap between the central beam 10 and the nozzle body 3 defines an outer channel which is annular in shape. Support means in the form of fins 30, extend between the central beam 10 and the nozzle body 3 to secure the deflector 7 in place. Grub screws are used to further secure the deflector 9 in position. The nozzle may also be provided with a pressure indicator switch (not shown) located in the deflector surface or on the body of the nozzle. Fixed rings 25 are also included to position the deflector within the nozzle body 3.

The box section 26 provides abutting surfaces at either end thereof, and further provides an adjustable gap 27 which can be reduced in size by the inclusion of further spacer rings (not shown). Typically, an additional spacer ring would be introduced at the downstream end of the box section 26 thereby moving the deflector in an upstream direction and therefore reducing the size of the adjustable gap 27. This also reduces the width of the end of the channel as defined by the distance between the deflector surface 9 and the chamfered surface 15.

It will be noted that the deflector 7 is generally frusto-conical or cone-shaped. The chamfered surface 15 provides a way of smoothing the flow of fluid at the downstream end of channel 23, and as a consequence creates a more laminar fluid flow.

Providing an adjustable gap between the deflector surface 9 and the chamfered surface 15 provides water flow having different profiles. For example, where the gap between the chamfered surface 15 and the deflector surface 9 is small, the flow of water from the nozzle will be disrupted and this will create a non-uniform flow to produce a more diffuse wall of water. Where this distance is larger the flow will be more laminar and the wall of water will be less diffuse.

The chamfered surface 15 forms part of a coupling ring which is attached to the nozzle body 3. The upstream end of the nozzle body 3 is provided with a nozzle coupler 31 which in this example is a screw thread. As the water has been filtered upstream, the gap between surfaces 9 and 15 will provide a flow path that is not restricted by the presence of large particulates. Accordingly, this will not block or inhabit the performance of the nozzle. Figure 2 provides a further cross-sectional view of the present invention and shows the outer surface of the central beam 10 and the fins 30. The features of this drawing are identical to the features shown in Figure 1.

Figure 3 shows the water flow path through the nozzle.

The water flows through the main channel 19 at the upstream end of the nozzle in direction A. The flow is

then split into two portions which flow through the central channel 21 in direction C and through the outer channel 23 in direction B. A filter (not shown) is attached to the filter coupler 33. This prevents particulates from entering the central channel and directs them out through the outer annular channel 23. This is desirable because the purpose of the central channel is to provide a fine mist of water by using a fine nozzle (not shown). The use of a filter prevents particulates from entering the fine nozzle, and thereby blocking it.

As the water flows through the outer channel 23 in direction B, the water is deflected from surface 9 outwards in a pre-determined direction. This direction is determined by the angle of the deflection surface 9 with respect to the direction of bulk flow through the channel 23. In this example, the surface 9 is at an angle of approximately 105° with respect to the central beam. Clearly, therefore, the deflector surface 9 is angled away from the direction of flow B.

Advantageously, it has been found that the use of a deflector surface in this configuration means that the general bulk flow B looses energy only when it is deflected from the surface 9. Therefore, it is possible to produce a more efficient nozzle that requires a lower water pressure to produce a wall of water that extends a predetermined distance from the nozzle than would be possible with the prior art nozzles. In addition, it is possible to produce walls of water that extend further with the same pressure than in the prior art.

It should be noted that in the prior art the exiting water impinges on a first surface, is thrown backwards onto a second directing surface for directing the water out from the nozzle. This causes the water to lose energy and therefore cause a reduction in overall pressure.

In addition, the present invention may also be provided with means for altering the width of the gap between the chamfered surface 15 and the deflector surface 9. In order to alter this distance, a spacer ring (not shown) is introduced into the nozzle body so as to reduce the width of gap 27. A number of rings of different width can be used to produce different gap sizes.

Figures 4a, 4b and 4c show the components from which an embodiment of the present invention can be made. Figure 4a shows the deflector means 7, Figure 4b shows the coupling ring 5 and Figure 4c shows the nozzle body 3. It is convenient for the nozzle of the present invention to be constructed in three parts in this manner as it allows easy cleaning and maintenance of the nozzle.

Figure 5 shows a second embodiment of the present invention in which sensors 112 are embedded into the front surface 111 of a nozzle 101. The sensors can be hard-wired and/or wirelessly and/or acoustically connected through the central channel 121 to a position upstream where data from the sensors can be analysed. The sensors can be temperature sensor, gas composition sensors or any other desired sensor.

In the examples of Figures 1-4 and 5, the fins 30 may be shaped to affect the flow of water through the outer channel 23.

The embodiments of the present invention described herein show a nozzle designed for manufacture using a lathe. Details of the component design may change where other manufacturing techniques are used to make the nozzle. Examples of alternative manufacturing techniques are casting, lost wax processing or a combination thereof.

In addition, the nozzle may be made in modular form or as a single component.

It is also envisaged that the present invention could be used for the escape route protection, well control and where blow arts occur.

Improvements and modifications may be incorporated herein without deviating from the scope of the invention.

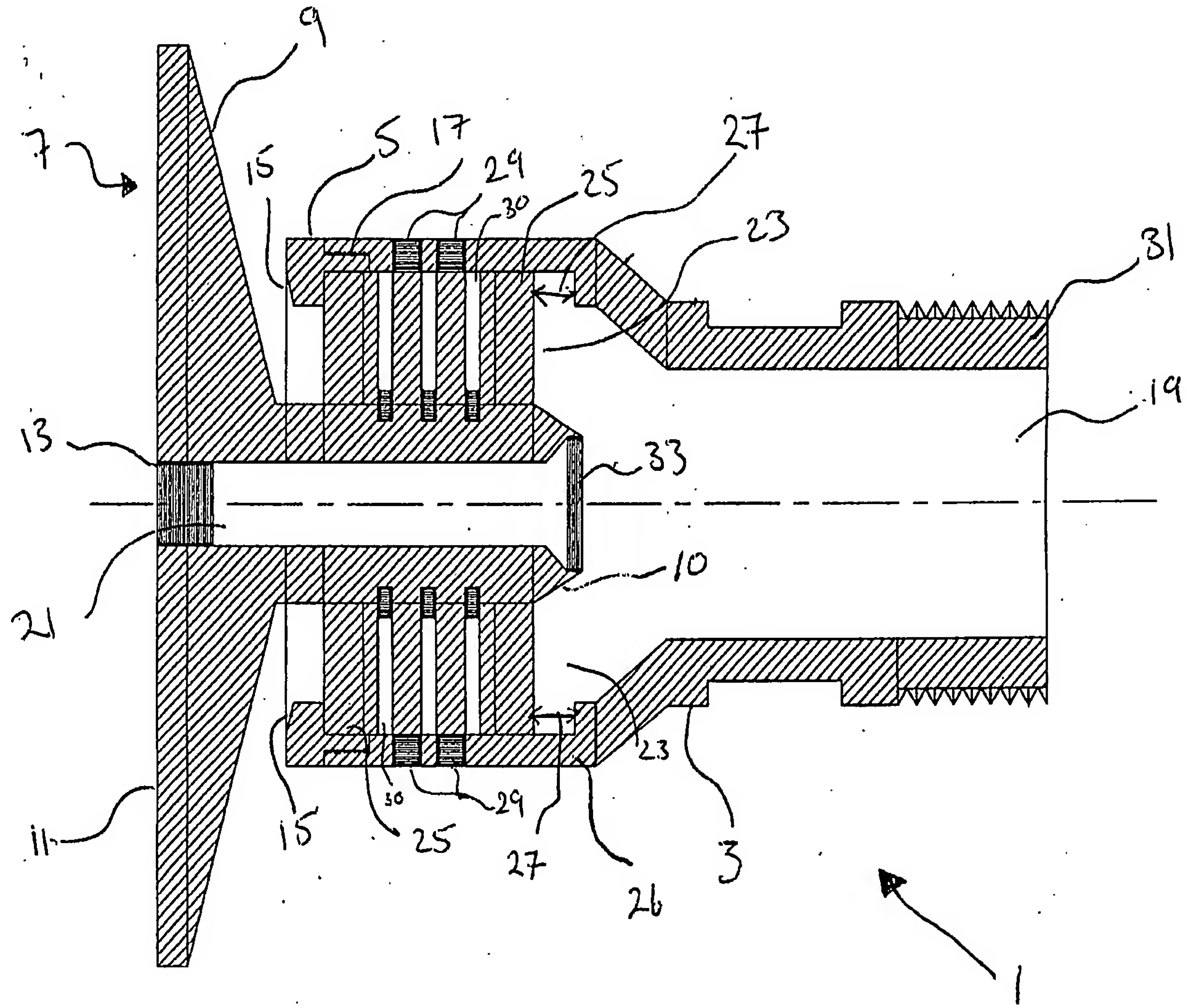

FIGURE 1

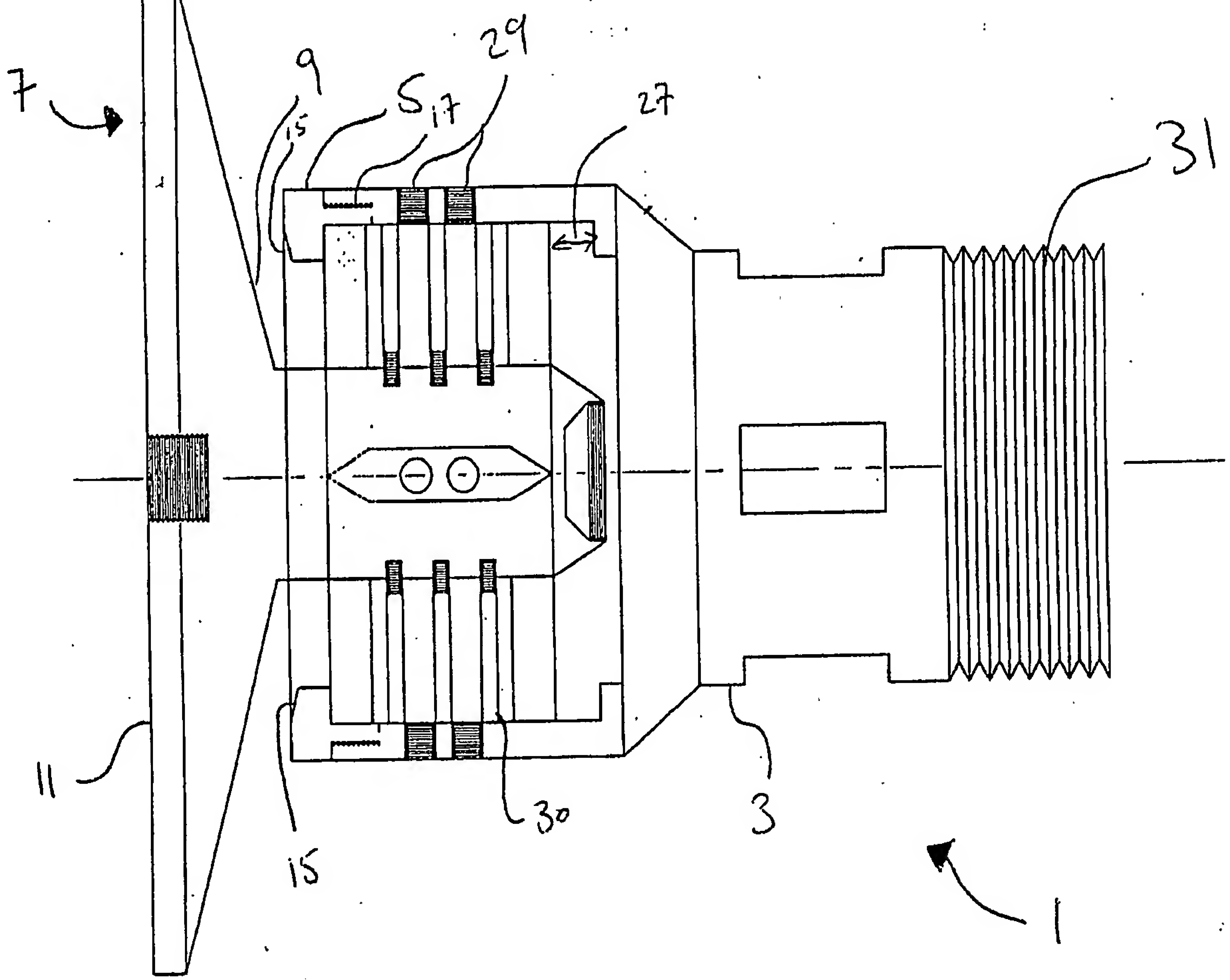

FIGURE 2

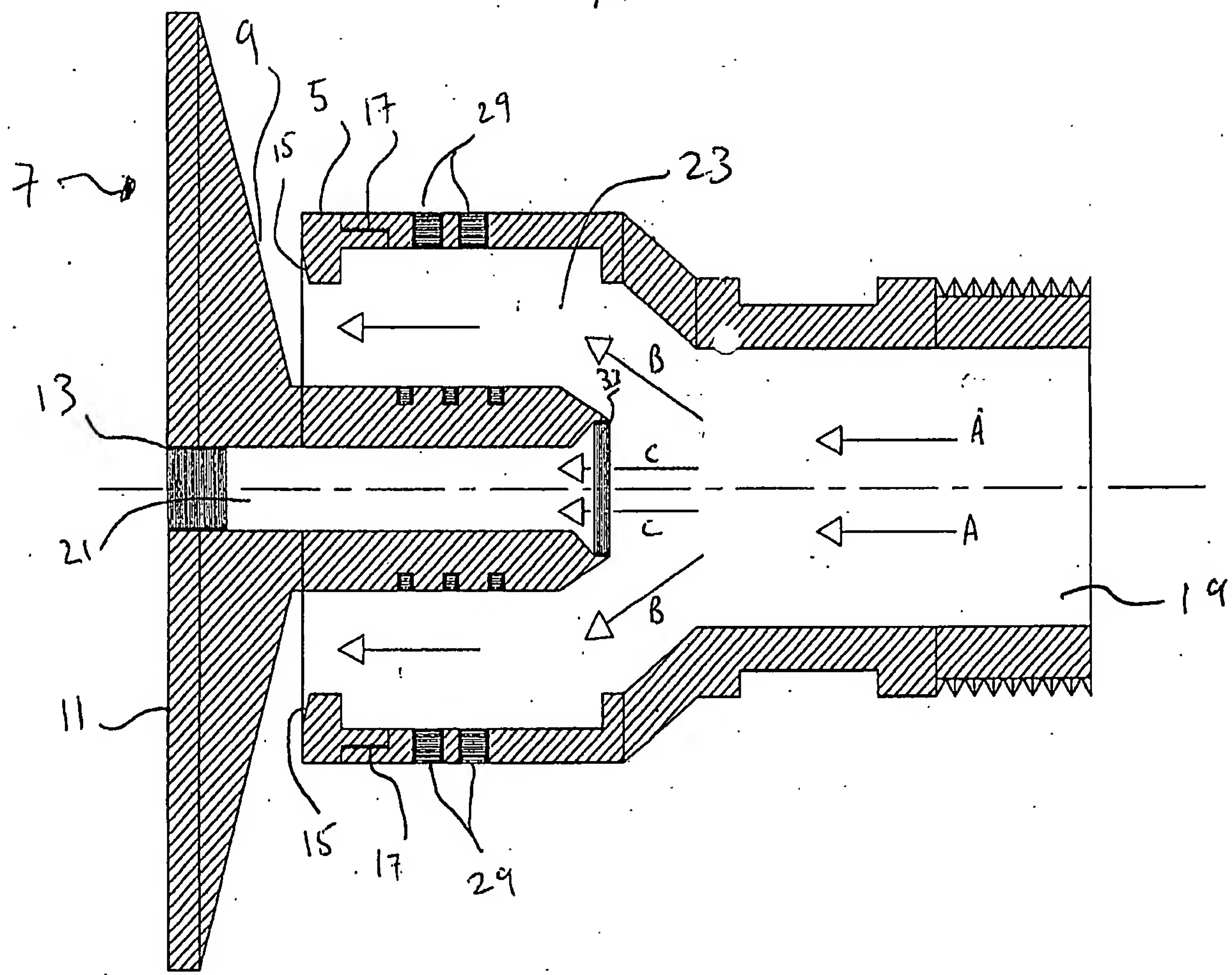

FIGURE 3

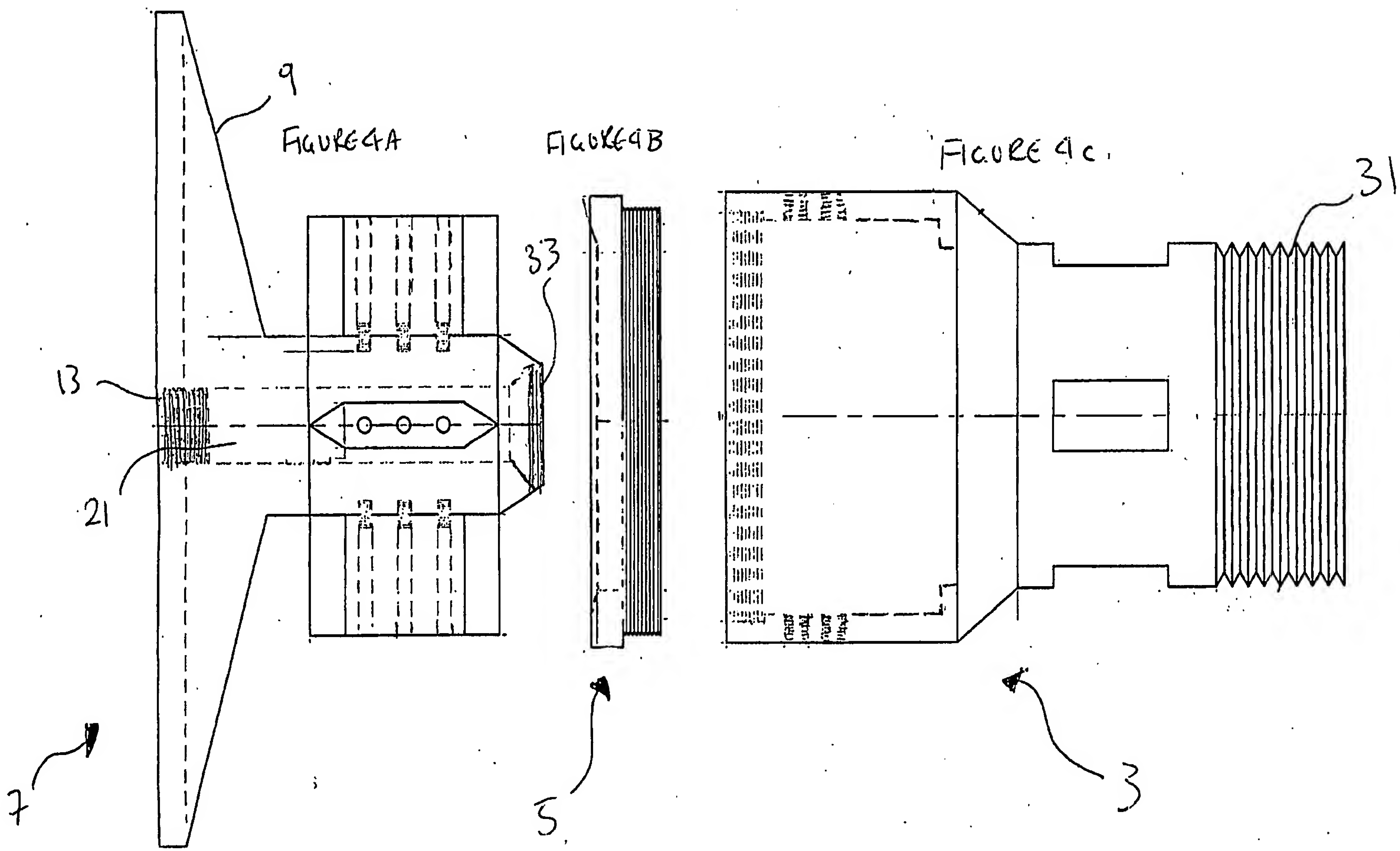
FIGURE 4A
FIGURE 4B
FIGURE 4C
9
13
21
33
7
5
3
31

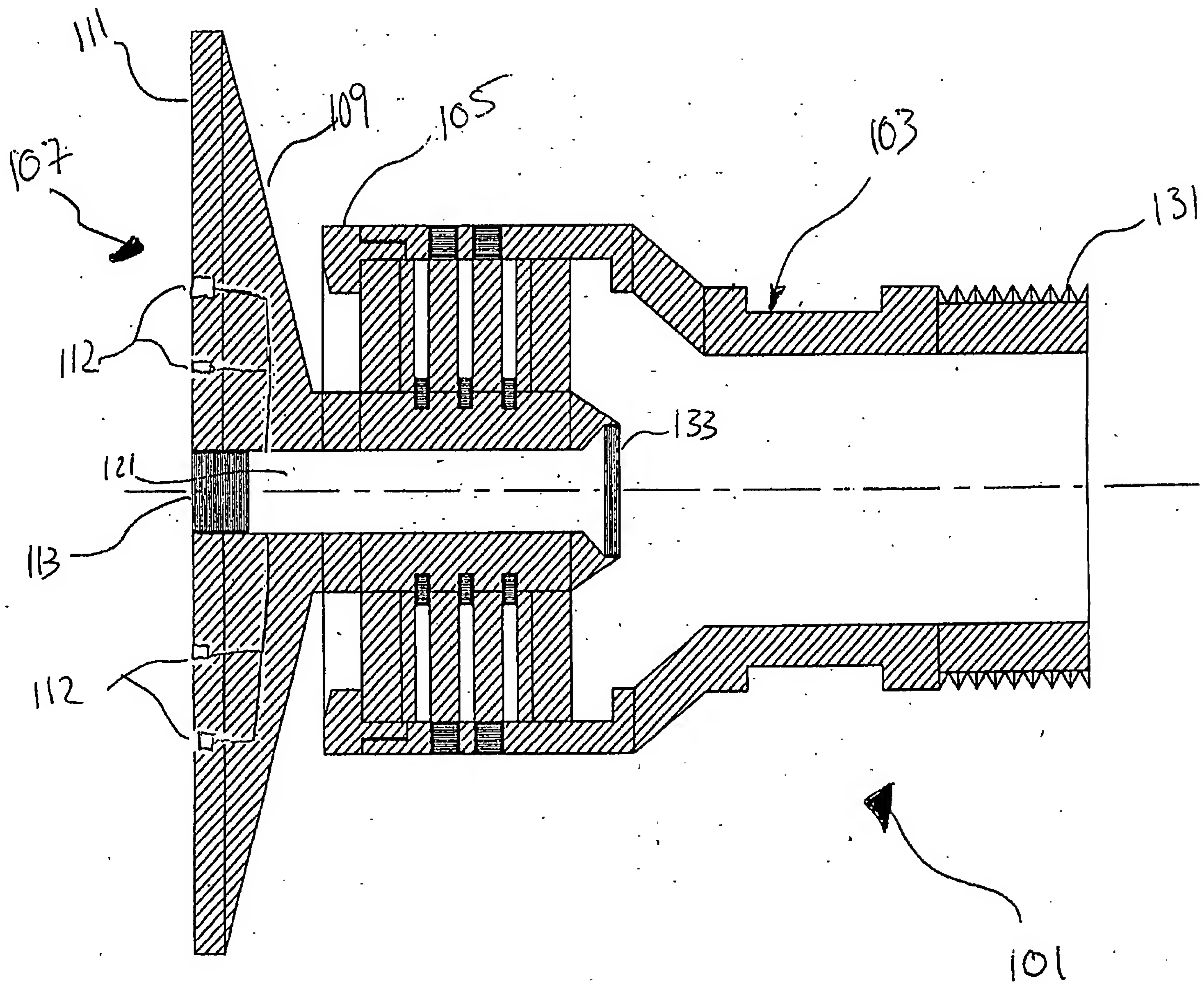

FIGURE 5